Evolving role of Mini-Grid Projects in India

June 29, 2018
## Meghraj Group Services

<table>
<thead>
<tr>
<th>Company</th>
<th>Meghraj Capital</th>
<th>Minerva Group</th>
<th>MTC Trust &amp; Corporate Services</th>
<th>Meghraj Capital Advisors</th>
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</thead>
</table>
| **INVESTMENT BANKING ADVISORY SERVICES** | • M&A and strategic advisory  
• Equity raising  
• Debt raising  
• Real estate financing  | • Offshore trust services  
• Onshore trust services  
• Corporate services  
• Corporate trust services  
• Fund administration  | • Onshore trust services  
• Corporate services  
• Corporate trust services  | • Policy & regulatory advisory  
• PPP advisory  
• Investment promotion  
• Feasibility studies  
• Institutional strengthening |
| **Services**                      |                                                                                |                                                                      |                                                                   |                                                                |
| **Offices**                      | • Kenya  
• UK  
• India  
• Japan  
• Dubai  
• USA  | • Jersey  
• UK  
• Switzerland  
• Mauritius  
• Dubai  
• Singapore  | • Kenya  | • India  
• Kenya  |
| **Clients**                      | • Private & public sector companies  
• High net worth individuals/ family offices  
• Financial institutions  
• Investors  | • High net worth individuals/ family offices  
• Private sector companies  
• Fund managers  | • High net worth individuals/ family offices  
• Private sector companies  
• Banks  
• Financial institutions  | • Private & public sector companies  
• Local and central governments  
• Development finance institutions |
| **Team Size**                    | • 30  | • 170  | • 10  | • 30  |
Our team members have **hands-on experience of working on international infrastructure assignments in 32 countries**, in addition to **more than 25 States in India**.
Agenda

1. Background
2. Role of Mini-Grid Projects with improvement in Grid
3. 24x7 scenario
4. Models for grid-interactive Mini-Grid Projects
5. Subsidy models for ensuring affordability
1. Background

2. Role of Mini-Grid Projects with improvement in Grid

3. 24x7 scenario

4. Models for grid-interactive Mini-Grid Projects

5. Subsidy models for ensuring affordability
India has achieved complete village electrification in April, 2018.

UP is marching towards complete household electrification by 2019.

Discoms in UP suffer loss of INR 2.40/unit for supplying electricity to domestic consumers.

Per unit loss (INR/unit) to Discom for supply to Domestic consumers in UP:

- ACoS: 6.74
- Average Revenue: 4.34
- Gap: -2.4

Household electrification in India:
- Un-electrified: 13%
- Electrified: 87%

Household electrification in UP:
- Un-electrified: 35%
- Electrified: 65%

Source: Saubhagya dashboard; dated June 28, 2018.
MGO implements **Mini-Grid project** for **generation & supply** of **electricity** through PDN in areas where **Distribution Licensee’s System doesn’t exist**.
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Transition in Mini-Grid Project operations with grid improvement

Supply to consumers from Mini-Grid Projects

- Option – I
  Stand alone system

- Option – II
  Excess supply to Discom

- Option – III
  Entire supply to Discom

Business Cases

Grid improvement
Stand alone operations of Mini-Grid Projects in electrified areas

Continue to supply to its consumers & exist in parallel with the grid

OPTIONS

Parallel network allows RE generator to supply electricity, irrespective of grid supply

Disconnected from Mini-Grid Project

New connections added

11 kV network

50 W 2 kW

DTR

Grid arrival/ Grid improvement

Low capacity cable line (low current carrying capacity)

Consumers not connected to Mini-Grid

RE Generator (say 5kW solar plant)

Load
Excess supply to grid from Mini-Grid Project

- **Mini-Grid Project**
  - RE Generator (say 5kW solar plant)
  - Low capacity cable line (low current carrying capacity)
  - Consumers not connected to Mini-Grid
  - Load

- **Grid arrival/ Grid improvement**

- **OPTIONS**
  - Continue to supply to its consumers and sell excess electricity to the grid at interconnection point

- **11 kV network**
  - DTR
  - RE Generator supplies excess electricity to grid
  - Automatic disconnector
  - Grid arrival/ Grid improvement

Disconnected from Mini-Grid on improvement in grid power supply
Entire supply to grid from Mini-Grid Project

- **Mini-Grid Project**: RE Generator (say 5kW solar plant)

  - **Low capacity cable line** (low current carrying capacity)

  - **Consumers not connected to Mini-Grid**: 50 W

  - **Load**: 50 W

**OPTIONS**

- **RE Generator supplies entire electricity to grid**

  - **Automatic disconnector**

  - **Entire load of consumer will be met through Grid Power**

- **Supply all electricity to the grid at interconnection point**

  - 50 W

- **RE generator supplies exclusively to the Grid**

- **11 kV network**

- **DTR**: 50 W 2 kW
Progressing towards grid interactive Mini-Grid Projects

On a project funded by Shakti Sustainable Energy Foundation, MCAPL is working towards pilot interconnection of Mini-Grid Projects in UP

Atrauli, Hardoi, UP
Meters have been installed at DTRs near Mini-Grid Projects to assess consumer loading & capacity for interconnection of Mini-Grid Projects

Pipargaoon, Hardoi, UP

There may be a need to allow bi-direction supply of electricity for improved consumer load management in future
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Discom’s plan of 24*7 may not be achieved in near future; thus tail end DRE has role to play

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Units</th>
<th>Discom*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Current scenario (with around 18 hrs of supply only)</td>
</tr>
<tr>
<td>Customers</td>
<td>Numbers</td>
<td>4,136</td>
</tr>
<tr>
<td>Connected Load</td>
<td>kW</td>
<td>9,047</td>
</tr>
<tr>
<td>Units supplied (Input Energy)</td>
<td>MU</td>
<td>6.6</td>
</tr>
<tr>
<td>Distribution Losses</td>
<td>%</td>
<td>37%</td>
</tr>
<tr>
<td>Units billed</td>
<td>MU</td>
<td>4.13</td>
</tr>
<tr>
<td>Collection Efficiency assumed</td>
<td>%</td>
<td>42%</td>
</tr>
<tr>
<td>Revenue collected</td>
<td>INR Lacs</td>
<td>53.95</td>
</tr>
<tr>
<td>O&amp;M Expense</td>
<td>INR Lacs</td>
<td>21.45</td>
</tr>
<tr>
<td>Net Thru Rate to Discom per unit (without factoring in power purchase cost)</td>
<td>INR/unit</td>
<td><strong>0.49</strong></td>
</tr>
</tbody>
</table>

• With this thru rate Discoms will find it tough to provide 24*7 power in rural areas.
• Losses of Discoms will increase because of addition of new consumers

So tail end DRE will have a role to play

Source: Based on actual data of one of the rural feeders in the state of Uttar Pradesh analyzed by MCAPL
Modes to achieve 24x7 power for all consumers in UP

Modalities to achieve 24x7 reliable & cost effective supply to consumers

**Discom improves supply**
- Discom sources electricity from present sources and/or enters into PPA with new plants for supply
- Increased burden on Discoms with each unit of electricity supplied in rural areas,
- Prone to transmission & distribution losses upon wheeling of electricity to last mile consumer,
- Stagnant efficiencies & losses
- Unnoticeable improvement in Through Rate
- Increased manpower costs

**Avails support of MGO in supply & grid management**
- Discom appoints MGO to supply electricity from Mini-Grid Project,
- Discom also allocates responsibility of grid management to MGO,
- MGO generates electricity from Mini-Grid Projects & supplies to Discom
- MGO also undertakes Metering, Billing, Collection for Discom,
- MGO reduces losses & improves efficiencies of Discom,
- Avoidance of power purchase costs from conventional generating sources for Discom
### Illustrative – Improvement in Through Rate for Discom under scenarios

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Year wise Through Rate realised (INR/unit)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Year 1</td>
</tr>
<tr>
<td>Scenario 1 Discom continues to supply for 18 hours as per rural schedule</td>
<td>0.34</td>
</tr>
<tr>
<td>Scenario 2 Discom improves supply to 22 hours</td>
<td>0.12</td>
</tr>
<tr>
<td>Scenario 3 Discom supplies 22 hours &amp; MGO supplies 2 hours using load limiters with grid management</td>
<td>0.25</td>
</tr>
<tr>
<td>Scenario 4 Discom supplies for 18 hours &amp; MGO supplies for 4 hours using load limiters with grid management</td>
<td>0.01</td>
</tr>
</tbody>
</table>

Source: Based on actual data of one of the rural feeders in the state of Uttar Pradesh analyzed by MCAPL
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Grid interactive Mini-Grid Projects with distribution management

Grid is live

Developer appointed to undertake MBC, O&M, investments in Discom’s network

Grid not available, supply under Islanding mode
Potential benefit and key challenges of the construct

**Benefits**

- Improved revenue realization for Discom
- Support in effective fulfillment of Universal Service Obligation (USO)
- Reduced AT&C losses for Discom
- Reduced operational costs for Discom
- Support in achieving RPO for Discom
- Reliable electricity supply to consumers
- Business viability for Project developer

**Challenges**

- The model can be implemented once the regulatory framework is developed
- Tariff to be charged by Mini-grid player is not reflective of DRE cost, rather based on retail tariff order
- Non-existence of Policy/Regulations in majority of states
- Undefined areas/potential by Central/State Govt.

MCAPL on a project funded by **Shakti Sustainable Energy Foundation**, is exploring opportunities of **integrating DRE projects with Discom’s grid** to improve supply & support in grid management.
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Parameters to ensure viability of Mini-Grid Projects

Activities

- **Implement DRE Project** (with energy storage) and interconnect with Discom’s network at Inter-connection Point,
- **Procure electricity from Discom** at Input Point at Input Rate,
- **Supply electricity to consumers** in allocated area,
- **Metering, Billing, Collection** of consumers in allocated area,
- **O&M** of Discom’s network, & **investments** in Discom’s network – new connection, pole, service line, etc.; rest investments, Discom to undertake (such as DTR, Sub-station, 11kV feeder, etc.),
- **Supply to consumers** under **islanding** mode through **load limiters** with limited load

Parameters defining viability

- **FiT**
  - for supply of electricity from DRE Project to Interconnection Point
- **Retail tariff**
  - for supplying electricity to consumers in rural areas
- **VGF**
  - manage imbalance between FiT & Retail tariff
- **Input Rate**
  - Payout to Discom for Input Energy
- **Asset Recovery**
  - Annuity based recovery for Capex in energy storage
Issues associated with Mini-Grid sector in India

- Non-availability of Policy at central level and in majority most of states,
- Despite of National Tariff Policy, 2016 mandating states to come up with Mini-Grid Regulations, only selective states have notified;
- Lack of financial support in form of subsidy/central financial assistance available to sector,
- Project implementation procedure not defined at central/state level,
- Unviable retail tariffs for sale of electricity from Mini-Grid Projects in few states for sale to Consumers/Discoms
- Lending facility limited to large scale project

- Applicable approvals/clearances & exemptions are not defined,
- No clarity on business viability upon grid arrival in few states
- Non-existence of technical details for implementation of Mini-Grid Projects at central level,
- Due to non-existence of policy at central level, cost of funding is higher,
- Due to small size & infirm nature of electricity, reluctance from Discoms to interconnect projects
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